NPL-U29-2-3-R2

HRS DOCUMENTATION RECORD--REVIEW COVER SHEET

Name of Site: McGuire Air Force Base #1

Contact Persons

Documentation Record	Steven T. McNulty Malcolm Pirnie, Inc.	(201) 529-4700
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Pathways, Components, or Threats Not Evaluated

In November 1982, an Initial Assessment/Records Research report was issued for the McGuire AFB #1 (MAFB) in completion of Phase I of the Department of Defense's Installation Restoration Program (IRP) (Ref. No. 3). The purpose of the IRP report was to identify and evaluate historical hazardous material disposal sites at the MAFB (Ref. Nos. 3, p. 1; 15, p. 48). The IRP identified seventeen (17) potential contamination sources on the Main Base at the MAFB (Ref. Nos. 3, pp. 12, 15-16; 15, p. 50). The IRP is presently evaluating the status of each area, ranging from confirmation sampling/characterization to Remedial Action decisions for others (Ref. Nos. 15, pp. 48-54; 18; 19). In addition to the seventeen (17) potential contamination sources, ten (10) Areas of Concern were identified on the Main Base where potentially unacceptable environmental conditions were identified (Ref. Nos. 15, p. 55; 21, pp. 36, 115). Of the twenty-seven (27) sources and areas identified by the Air Force at the site as contaminated, six (6) are presented herein as part of four (4) waste sources for the MAFB HRS evaluation. The four waste sources identified in this HRS Documentation Record most likely comprise only a portion of the MAFB NPL site. The information on these four sources is sufficient to properly evaluate them for HRS purposes and is sufficient to show the site qualifies for the NPL. However, any CERCLA eligible releases, identified or unidentified at this time in the HRS scoring comprise the site.

The groundwater migration pathway was not evaluated. The site is located above the Atlantic Coastal Plain Aquifer system. This aquifer system is composed of water bearing layers of sand and gravel interbedded between confining units of silts and clays. The population within four-miles of the site relies on groundwater as the primary source for drinking water supplies; however, the aquifer of concern, where the significant majority of potable water wells are completed, is situated beneath a series of confining units. The confining units of silts and clay lower the potential to release factor for the groundwater migration pathway. This was the primary factor in the groundwater migration pathway not being evaluated. It should be noted though that chemical analysis of groundwater samples collected from numerous monitoring wells across the site show the presence of organic and inorganic hazardous substances at concentrations significantly above background conditions. These data results may document an observed release to the surficial aquifer at the site.

The groundwater to surface water migration component of the surface water will not be evaluated. The primary mechanism by which the hazardous substances of concern are migrating into the Crosswicks Creek watershed is via overland flow due to the proximity of the site to the North and South Runs.

As only one waste source evaluated herein had sufficient soil sampling data to qualify for evaluation of the Soil Exposure Pathway; however, its associated hazardous waste quantity factor values and target factor category values were relatively low. It was determined that the soil exposure pathway would not contribute significantly to the HRS site score; therefore it was not evaluated.

Due to the lack of documentation regarding an observed release to air and the relatively low population concentrations in the immediate vicinity of the CERCLA-eligible waste sources on site, it was determined that the air migration pathway score would not contribute significantly to the HRS site score; therefore, it also was not evaluated.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
EPA NATIONAL PRIORITIES LIST (NPL) July 1999
OSWER/OERR State, Tribal, and Site Identification Center Washington, DC 20460

MCGUIRE AIR FORCE BASE #1
Wrightstown, New Jersey

The McGuire Air Force Base #1 site (MAFB) is an active facility that occupies more than 3,500 acres in a rural area of Burlington County, New Jersey. The base is bordered to the north by the community of Wrightstown, and to the east, south, and west by the U.S. Army's Fort Dix military installation. MAFB is located within the boundaries of the Pinelands National Reserve. The Pinelands are classified as Federal Land designated for the Protection of Natural Ecosystems. The primary source for both community and private drinking water supplies in the vicinity of the site is ground water obtained from the various aquifers comprising the Atlantic Coastal Plain. There are two major drainage divides on site, and several streams to which surface runoff is directed. An extensive system of wetlands is found along both major surface water drainage pathways.

MAFB originated in 1937 as an adjunct to the U.S. Army Training Center at Fort Dix and functioned under control of the U.S. Army until 1948, when jurisdiction over the facility was transferred to the U.S. Air Force. Past activities at MAFB in support of operational missions created a number of waste sources of potential environmental concern. In 1982, the U.S. Air Force completed Phase I of the Installation Restoration Program (IRP) investigation "to identify, confirm/quantify, and remediate problems caused by past management of hazardous wastes" at the base. For the purposes of Hazard Ranking System scoring, four waste sources were identified: 1) Zone 1 Landfills (comprised of Landfill Nos. 4, 5, and 6); 2) Landfill No. 2; 3) Landfill No. 3; and 4) the Defense Reutilization and Marketing Office. The four waste sources comprise only a portion of CERCLA eligible areas of the MAFB site. Although only four sources are scored at this time, any CERCLA eligible areas of concern, identified or unidentified at this time, and releases associated with those areas, comprise the site. Decision documents concerning some of the waste sources were issued in September 1991; however, no removal actions or remediation associated with the waste sources scored have occurred.

Phases of the IRP are currently ongoing at the MAFB, including Remedial Investigation and Site Inspection environmental sampling. Hazardous substances detected by analysis of surface soil, subsurface soil, waste, leachate, groundwater, and surface water/sediment samples collected include volatile organic compounds, polychlorinated biphenyls (PCBs), and inorganic hazardous substances. A release to surface water of nickel and mercury is documented. Sediment samples collected from wetlands immediately downstream of Landfill No. 2 contained high concentrations of nickel and mercury. In addition, Cookstown Pond, located near this area, is a known local fishing area.

[The description of the site (release) is based on information available at the time the site was scored. The description may change as additional information is gathered on the sources and extent of contamination. See 56 FR 5600, February 11, 1991, or subsequent FR notices.]

HRS DOCUMENTATION RECORD

Name of Site: McGuire Air Force Base #1

EPA Region: 2 Date Prepared: May 15, 1999

Street Address of Site: Wrightstown-Cookstown Road, Wrightstown

County and State: Burlington County, New Jersey

General Location in the State: Central

Topographic Map: New Egypt, NJ

Latitude: 40° 01' 05" N Longitude: 74° 35' 37" W

EPA ID Number: NJ0570024018

Ref. Nos. 12; 33

Scores

Air Pathway	Not Scored
Ground Water Pathway	Not Scored
Soil Exposure Pathway	Not Scored
Surface Water Pathway	94.41
HRS SITE SCORE	47.20

WORKSHEET FOR COMPUTING HRS SITE SCORE

		S	S^2
1.	Ground Water Migration Pathway Score (S_{gw}) (from Table 3-1, line 13)	Not Scored	Not Scored
2a.	Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	94.41	8913.25
2b.	Ground Water to Surface Water Migration Component (from Table 4-25, line 28)	Not Scored	Not Scored
2c.	Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	94.41	8913.25
3.	Soil Exposure Pathway Score (S_s) (from Table 5-1, line 22)	Not Scored	Not Scored
4.	Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	Not Scored	Not Scored
5.	Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		8913.25
6.	**HRS Site Score** Divide the value on line 5 by 4 and take the square root		47.20

1. Site Name: McGuire AFB #1
   (as entered in CERCLIS)

2. Site CERCLIS Number: NJ0570024018

3. Site Reviewer: Steven T. McNulty

4. Date: 5/15/99

5. Site Location: Wrightstown/Burlington County, New Jersey
   (City/County,State)

6. Congressional District:3

7. Site Coordinates: Multiple

   Latitude: 40°01'05.0" Longitude: 074°35'37.0"

	Score
Ground Water Migration Pathway Score (Sgw)	0.00
Surface Water Migration Pathway Score (Ssw)	94.41
Soil Exposure Pathway Score (Ss)	0.00
Air Migration Pathway Score (Sa)	0.00

Site Score	47.20

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors DRINKING WATER THREAT	Maximum Value	Value Assigned
Likelihood of Release		
1. Observed Release	550	550
2. Potential to Release by Overland Flow		
2a. Containment	10	NS
2b. Runoff	25	NS
2c. Distance to Surface Water	25	NS
2d. Potential to Release by Overland Flow [lines 2a(2b+2c)]	500	NS
3. Potential to Release by Flood		
3a. Containment (Flood)	10	NS
3b. Flood Frequency	50	NS
3c. Potential to Release by Flood (lines 3a x 3b)	500	NS
4. Potential to Release (lines 2d+3c)	500	NS
5. Likelihood of Release	550	550
Waste Characteristics		
6. Toxicity/Persistence	*	1.00E+04
7. Hazardous Waste Quantity	*	100
8. Waste Characteristics	100	32
Targets		
9. Nearest Intake	50	0.00E+00
10. Population		
10a. Level I Concentrations	**	0.00E+00
10b. Level II Concentrations	**	0.00E+00
10c. Potential Contamination	**	0.00E+00
10d. Population (lines 10a+10b+10c)	**	0.00E+00
11. Resources	5	5.00E+00
12. Targets (lines 9+10d+11)	**	5.00E+00
13. DRINKING WATER THREAT SCORE	100	1.07

* Maximum value applies to waste characteristics category.
** Maximum value not applicable.

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors HUMAN FOOD CHAIN THREAT	Maximum Value	Value Assigned
Likelihood of Release		
14. Likelihood of Release (same as line 5)	550	550
Waste Characteristics		
15. Toxicity/Persistence/Bioaccumulation	*	5.00E+08
16. Hazardous Waste Quantity	*	100
17. Waste Characteristics	1000	320
Targets		
18. Food Chain Individual	50	2.00E+01
19. Population		
19a. Level I Concentrations	**	0.00E+00
19b. Level II Concentrations	**	0.00E+00
19c. Pot. Human Food Chain Contamination	**	3.00E-03
19d. Population (lines 19a+19b+19c)	**	3.00E-03
20. Targets (lines 18+19d)	**	20.003
21. HUMAN FOOD CHAIN THREAT SCORE	100	42.67

* Maximum value applies to waste characteristics category.
** Maximum value not applicable.

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors ENVIRONMENTAL THREAT	Maximum Value	Value Assigned
Likelihood of Release		
22. Likelihood of Release (same as line 5)	550	550
Waste Characteristics		
23. Ecosystem Toxicity/Persistence/Bioacc.	*	5.00E+08
24. Hazardous Waste Quantity	*	100
25. Waste Characteristics	1000	320
Targets		
26. Sensitive Environments		
26a. Level I Concentrations	**	0.00E+00
26b. Level II Concentrations	**	0.00E+00
26c. Potential Contamination	**	23.75E+00
26d. Sensitive Environments (lines 26a+26b+26c)	**	23.75E+00
27. Targets (line 26d)	**	23.75E+00
28. ENVIRONMENTAL THREAT SCORE	60	50.67
29. WATERSHED SCORE	100	94.41
30. SW: OVERLAND/FLOOD COMPONENT SCORE (Sof)	100	94.41

* Maximum value applies to waste characteristics category.
** Maximum value not applicable.

REFERENCES

Reference Number	Description of the Reference
1.	Hazard Ranking System; Final Rule, 40 Code of Federal Regulations Part 300. Federal Register, Volume 55, No. 241, December 14, 1990. [2 pages, nonconsecutive]
2.	Superfund Chemical Data Matrix, June 1996. [11 pages, nonconsecutive]
3.	Installation Restoration Program, Phase I: Records Search, McGuire Air Force Base, New Jersey. Engineering-Science, Inc., November 1982. [243 pages]
4.	Telecon Note: Conversation between King Mak, Project Manager, Installation Restoration Program, U.S. Air Force, and Steven T. McNulty, Malcolm Pirnie, Inc., regarding Phase I: Records Search Report, August 26, 1994. [1 page]
5.	Draft Final Remedial Investigation Report, Landfill No. 5 (LF-19), MAFB, prepared by URS Consultants, Inc., March 1999. [83 pages, non-consecutive]
6.	Draft Final Remedial Investigation Report, Landfill No. 6 (LF-20), MAFB, prepared by URS Consultants, Inc., March 1999. [111 pages, non-consecutive]
7.	15-Mile Surface Water Pathway Map, MAFB Site, U.S. Department of the Interior, Fish and Wildlife Service, National Wetlands Inventory Maps, Quadrangles for New Egypt, NJ, 1957, photorevised 1971, and Allentown, NJ, 1957, photorevised 1981. [1 sheet]
8.	Telecon Note: Conversation between Frank Castro, Frank's Tackle Supply, and Steven T. McNulty, Malcolm Pirnie, Inc., regarding fishing use of Cookstown Pond, May 4, 1999. [1 page]
9.	Soil Survey, Burlington County New Jersey, U.S. Department of Agriculture-Soil Conservation Service, October 1971. [15 pages, nonconsecutive]
10.	Facsimile from Tim Reed, U.S. Geological Survey (USGS), to Steve McNulty, Malcolm Pirnie, Inc., May 7, 1999. Subject: Stream Flow Rate Information. [2 pages]
11.	The Revised Hazard Ranking System: Policy on Evaluating Sites After Waste Removals, Publication 9345.1-03FS. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, October 1991. [10 pages]
12.	U.S. EPA Superfund Program - Region II, List-8I Site/Action Listing, page 229, April 15, 1999. [1 page, nonconsecutive]
13.	McGuire Air Force Base, N.J., Land Management Plan, Tab VI, Attachment 4, Floodplains & Wetlands, prepared by Base Civil Engineer, 1982. [3 pages, non-consecutive]
14.	Surface Water Intake Locations, Bureau of Safe Drinking Water, March 1992. [6 pages]
15.	Management Action Plan, MAFB, Wrightstown, New Jersey, June 1998. [255 pages]

REFERENCES (CONT'D)

Reference Number	Description of the Reference
16.	Draft Final Site Characterization Summary, Informal Technical Information Report, Focused Feasibility Studies and Treatability Studies at Five Studies, Volume 1 of 2 - Text, Tables & Figures, prepared for MAFB by URS Greiner, Inc., November 1997. [279 pages]
17.	Rainfall Frequency Atlas of the United States, U.S. Department of Commerce, U.S. Government Printing Office, Washington, D.C. [2 pages]
18.	Decision Document, McGuire Air Force Base, Site LF-19 (Landfill No. 5). Frank Cardile, Brigadier General, USAF Commander, September 27, 1991. [6 pages]
19.	Decision Document, McGuire Air Force Base, Site LF-20 (Landfill No. 6). Frank Cardile, Brigadier General, USAF Commander, September 27, 1991. [6 pages]
20.	Draft Final Remedial Investigation/Site Characterization Summary Report, MAFB, prepared for the MAFB by EA Engineering Science, and Technology, Inc., January 1998. [393 pages, non-consecutive]
21.	Final Site Inspection Report, MAFB, prepared for the Air Force Center for Environmental Excellence by EA Engineering, Science, and Technology, December 1998. [272 pages, non-consecutive]
22.	Memorandum from Valerie Smith, Malcolm Pirnie, Inc., to Steven McNulty, Malcolm Pirnie, Inc. regarding Data Validation - MAFB, May 24, 1996. [36 pages]
23.	The Pinelands Protection Act of 1979, New Jersey Statutes Annotated (N.J.S.A.), 18A-1 et seq. [24 pages]
24.	State of New Jersey Pinelands Commission, New Jersey Pinelands, Comprehensive Management Plan for the Pinelands National Reserve and Pinelands Area, adopted November 21, 1980. [15 pages]
25.	National Parks and Recreation Act of 1978, 95th Congress, Public Law 95-625, November 10, 1978. [10 pages]
26.	Surface Water Classifications, Surface Water Quality Standards, N.J.A.C. 7:9B, New Jersey Department of Environmental Protection/Office of Land and Water Planning, August 1994. [10 pages, nonconsecutive]
27.	Correspondence: to file, from Lisa Greco, Malcolm Pirnie, Inc., May 14, 1999. Subject: Fisheries. [2 pages]
28.	NWI Maps Made Easy by Glenn S. Smith, U.S. Fish and Wildlife Service, November 1991. [9 pages, nonconsecutive]
29.	Remedial Investigation Report, Landfill No. 6, MAFB, Internal Draft, prepared for Hazardous Waste Remedial Actions Program by ABB Environmental Services, Inc., October 1993. [95 pages, non-consecutive]

REFERENCES (CONT'D)

Reference Number	Description of the Reference
30.	Remedial Investigation Report, Landfill No. 5, MAFB, Internal Draft, prepared for Hazardous Waste Remedial Actions Program by ABB Environmental Services, Inc., October 1993. [76 pages, non-consecutive]
31.	Draft Final Site Characterization Summary, Informal Technical Information Report, Focused Feasibility Studies and Treatability Studies at Five Studies, Volume 2 of 2 - Appendices, prepared for MAFB by URS Greiner, Inc., November 1997. [273 pages, nonconsecutive]
32.	Draft Interim Response Action Workplan at the Defense Reutilization and Marketing Office, prepared for the HQ AFCEE/ERD by URS Greiner Woodward Clyde, Inc., March 1999. [279 pages]
33.	Site Location Map, McGuire Air Force Base, USGS Quadrangle, New Egypt, N.J., 1957, photorevised 1971. [1 sheet]
34.	USEPA Contract Laboratory Program, Statement of Work for Inorganic Analysis, ILMO 4.0. [2 pages, nonconsecutive]
35.	Letter from National Environmental Testing, Inc. to ABB Environmental, Inc., regarding McGuire AFB - Analytical Data, June 1, 1991. [4 pages, nonconsecutive]
36.	Letter from National Environmental Testing, Inc. to E.C. Jordan Co./ABB Environmental, Inc., regarding McGuire AFB - Analytical Data, May 23, 1991. [4 pages, nonconsecutive]

SOURCE DESCRIPTION

2.2 Source Characterization

Number of the source: 1

Name and description of the source: Zone 1 - Landfills

Zone 1 is composed of three landfills, Nos. 4, 5, and 6, that are located in proximity to each other on the eastern portion of the MAFB (Ref. Nos. 3, p. 93; 21, p. 108). Zone 1 is drained by the South Run of Crosswicks Creek, which bisects the area and flows southeasterly off the MAFB (Ref. Nos. 3, p. 94; 21, p. 108;7).

Landfill No. 4 is located west of MAFB's Wastewater Treatment Plant (WWTP) and south of the South Run (Ref. Nos. 3, p. 94; 21, p. 108). The irregularly T-shaped inactive landfill received wastes from approximately 1958 to 1973 (Ref. No. 16, pp. 36, 219, 225). Wastes were deposited into trenches that were excavated to a depth of approximately 15 feet (Ref. No. 16, p. 36). The types of wastes disposed of in the landfill included general base refuse, coal ash, miscellaneous industrial chemicals (some reportedly in 55-gallon drums), spent methyl ethyl ketone, toluene, paints and thinners, empty cans and drums from the Entomology Shop, and empty containers and off-specification pesticides from the Pavement and Grounds Shop (Ref. Nos. 3, pp. 68, 70, 74, 89, 93; 4; 16, p. 36). The landfill was leveled and covered with sandy soil (Ref. No. 3, p. 93; 16, pp. 36-37). Fill thickness has been observed up to 17 feet and the boundaries of the landfill were established by a Ground Penetrating Radar (GPR) survey (Ref. No. 16, pp. 16, 100). Landfill No. 4 was identified by the MAFB IRP and all IRP activities follow CERCLA procedures (Ref. No. 15, pp. 22, 52). Potential remedial options for Landfill No. 4 are being considered under a Focused Feasibility Study phase of the IRP (Ref. Nos. 15, pp. 52-53; 16, p. 141). A leachate sample was collected from the landfill during a 1996 field investigations (Ref. No. 16, pp. 105-106, 211-212). Chemical analysis of the leachate samples detected inorganic hazardous substances at concentrations significantly greater than those detected in a background groundwater sample collected during a similar time frame (Ref. No. 16, pp. 101-102, 105-106, 204-205, 211-212, 244, 266-267). The leachate sample was analyzed using SW-846 method 6010 and a validation was performed (Ref. No. 31, p. 148).

Landfill No. 5 is located northwest of the WWTP, between the WWTP access road and the west bank of the South Run (Ref. Nos. 5, pp. 13, 58; 21, p. 108). This landfill is long and narrow covering approximately 5 acres (Ref. No. 5, pp. 13, 58). The edge of the landfill adjacent to the South Run drops steeply to the elevation of the creek (Ref. No. 5, p. 58). The landfill operated from approximately 1970 to 1973; wastes disposed of using a trench and fill method were routinely burned to reduce the volume of material (Ref. Nos. 3, pp. 89, 93; 5, pp. 13-14). The types of wastes disposed of in the landfill included primarily coal ash, wood, and metal wastes (Ref. Nos. 3, pp. 89, 93; 5, pp. 13-14). The landfill is covered with sandy soil which supports grass, trees and shrubs (Ref. Nos. 3, p. 93; 5, p. 14). Boring samples were collected from the landfill in 1991 (Ref. No. 5, pp. 28-29, 50, 52, 63). Landfill No. 5 was identified by the MAFB IRP and all IRP activities follow CERCLA procedures (Ref. No. 15, pp. 22, 53). A decision document for Landfill No. 5 was issued under the IRP indicating the Long-term Monitoring was the appropriate remedial response (Ref. Nos. 15, p. 53; 18, p. 3). Chemical analysis detected inorganic hazardous substances at concentrations significantly greater than those detected in a background soil sample (Ref. Nos. 5, pp. 50, 52, 63, 79, 83; 30, pp. 10-11, 21). These samples were analyzed using the Contract Laboratory Program (CLP) Statement of Work (SOW), and were validated using HAZWRAP Level C Procedures (Ref. No. 30, pp. 50-68).

Landfill No. 6 is located north of the WWTP and the South Run, adjacent to the eastern boundary of the MAFB (i.e., to the east of Browns Mills-Cookstown road)(Ref. Nos. 6, pp. 13, 57; 21, p. 108). Landfill No. 6 operated from 1973 to 1976 (Ref. Nos. 3, pp. 93, 95; 6, p. 13). Wastes were deposited using the trench and fill method (Ref. Nos. 3, p. 95; 6, p. 13). The trenches were excavated to a depth of approximately 15 feet and reportedly extended into the water table (Ref. Nos. 3, p. 95; 6, p. 13). No burning occurred at this landfill; the landfill was used for the disposal of general refuse generated by the base (Ref. No. 6, p. 13). The general base refuse consisted of concrete, metal, wood, paper, and plastic (Ref. No. 6, p. 13). In 1976, landfill was closed with a 1 to 2-foot thick soil cover (Ref. No. 6, p. 14). Additional cover was added to the landfill in 1982 (Ref. No. 6, p. 14). Landfill No. 6 was identified by the MAFB IRP and all IRP activities follow CERCLA procedures (Ref. No. 15, pp. 22, 53). A decision document for Landfill No. 6 was issued under the IRP indicating the Long-term Monitoring was the appropriate remedial response (Ref. Nos. 15, p. 53; 19, p. 4). Chemical analysis of a leachate sample detected inorganic hazardous substances at concentrations significantly greater than those detected in a background groundwater sample collected during a similar time frame (Ref. No. 6, pp. 23-24, 29, 55, 57, 77). Chemical analysis of the soil and soil/waste samples detected inorganic hazardous substances at concentrations significantly greater than those detected in a background soil sample (Ref. No. 6, pp. 27-28, 50, 52, 77). These soil samples were analyzed using the CLP SOW, and were validated using HAZWRAP Level C Procedures (Ref. No. 29, pp. 64-85).

Location of the source, with reference to a map of the site:

Zone 1 is located in the eastern portion of the MAFB; Zone 1 is bounded to the south and east by the installation boundary (Ref. No. 16, p. 108).

Containment

Release to ground water

Not Evaluated

Release via overland migration and/or flood

There are no known run-on control and runoff management systems associated with the three landfills in Zone 1 (Ref. Nos. 3, pp. 93-95, 108, 112-113; 16, p. 37). Landfill No. 4 was leveled and covered with sandy soil (Ref. No. 16, p. 37). Landfill No. 5 was covered with a sandy soil cover that supports vegetation, shrubs and trees (Ref. No. 5, p. 14). Landfill No. 6 was closed with a 1 to 2-foot thick soil cover (Ref. No. 6, p. 14). Additional cover was added to the landfill in 1982 (Ref. No. 6, p. 14). A containment factor value of 10 is assigned since neither a maintained engineered cover nor a functioning and maintained run-on control system and runoff management system is present (Ref. No. 1, Table 4-2).

2.4.1 Hazardous Substances

Hazardous substance	Evidence	Reference
Landfill No. 4		
Methyl Ethyl Ketone	Corrosion Control Shop Personnel reported that spent methyl ethyl ketone was disposed of in the On-Base Landfills.	Nos. 3, pp. 68, 74; 4
Toluene	Corrosion Control Shop Personnel reported that toluene was disposed of in the On-Base Landfills.	Nos. 3, pp. 68, 74; 4

Source Hazardous Substances	Sample Evidence	Concentration	DLs	Units
Landfill No. 4				
Arsenic	01LH01WL (Ref. Nos. 16, p. 267; 31, pp. 99, 178)	1020	3[1]	µg/l[2]
Cadmium	01LH01WL (Ref. Nos. 16, p. 267; 31, pp. 99, 178)	114	1[1]	µg/l
Lead	01LH01WL (Ref. Nos. 16, p. 267; 31, pp. 99, 178)	4280	2[1]	µg/l
Nickel	01LH01WL (Ref. Nos. 16, p. 267; 31, pp. 99, 178)	341	1[1]	µg/l
Zinc	01LH01WL (Ref. Nos. 16, p. 267; 31, pp. 99, 178)	13800	2[1]	µg/l
Landfill No. 5				
Zinc	13MS-101-006 (Ref. Nos. 5, pp. 50, 63, 79; 30, pp. 41, 50)	122	7.3[3]	mg/kg[4]
Landfill No. 6				
Barium	14MS103 (5-7 ft) (Ref. Nos. 6, pp. 50, 77, 105; 29, pp. 39, 64, 84)	69.3J[5]	58[3]	mg/kg
Cadmium	14MS103 (5-7 ft) (Ref. Nos. 6, pp. 50, 77, 105; 29, pp. 39, 64)	2.9	1.5[3]	mg/kg
	14MS104 (5-7 ft) (Ref. Nos. 6, pp. 50, 77, 110; 29, pp. 39, 64)	4.2	1.3[3]	mg/kg
Lead	14LT-102 (Ref. Nos. 6, pp. 55, 77; 29, pp. 56, 64, 84)	64.7J[5]	3[3]	µg/l
	14 PS101 (Ref. Nos. 6, pp. 52, 77; 29, pp. 22-23, 44, 64)	29	0.68[3]	mg/kg

Source Hazardous Substances	Evidence	Concentration	DL	Units
Nickel	14MS103 (5-7 ft) (Ref. Nos. 6, pp. 50, 77, 105; 29, pp. 39, 64)	20	11.6[3]	mg/kg
	14MS104 (5-7 ft) (Ref. Nos. 6, pp. 50, 77, 110; 29, pp. 39, 64)	14.8	10.4[3]	mg/kg
Zinc	14MS103 (5-7 ft) (Ref. Nos. 6, pp. 50, 77, 105; 29, pp. 39, 64, 84)	32.4J[5]	5.8[3]	mg/kg
	14MS104 (5-7 ft) (Ref. Nos. 6, pp. 50, 77, 110; 29, pp. 39, 64)	47.8	5.2[3]	mg/kg
	14 PS101 (Ref. Nos. 6, pp. 52, 77; 29, pp. 22-23, 44, 64)	45.6	4.6[3]	mg/kg

Background Hazardous Substances	Evidence	Concentration	DL	Units
Landfill No. 4				
Arsenic	12MW101RWG (Ref. Nos. 16, pp. 205, 244, 267; 31, pp. 95, 166)	14	3[1]	µg/l
Cadmium	12MW101RWG (Ref. Nos. 16, pp. 205, 244, 267; 31, pp. 95, 166)	6.1	1[1]	µg/l
Lead	12MW101RWG (Ref. Nos. 16, pp. 205, 244, 267; 31, pp. 95, 166)	9.5	2[1]	µg/l
Nickel	12MW101RWG (Ref. Nos. 16, pp. 205, 244, 267; 31, pp. 95, 132, 166)	55.9	1[1]	µg/l
Zinc	12MW101RWG (Ref. Nos. 16, pp. 205, 244, 267; 31, pp. 95, 132, 166)	42.4J[3]	2[1]	µg/l
Landfill No. 5				
Zinc	13MS-102-005 (Ref. Nos. 5, pp. 50, 63, 83; 30, pp. 41, 50, 68)	6J[5]	5[3]	mg/kg
Landfill No. 6				
Barium	14MS101 mg/kg (Ref. Nos. 6, pp. 50, 77, 97; 29, pp. 39, 64, 84)	Non Detect [11.2][][6]J[5]	5 2 [3]	
Cadmium	14MS101 (Ref. Nos. 6, pp. 50, 77, 97; 29, pp. 39, 64, 84)	Non-Detect	1.3[3]	mg/kg
Lead	14MW101 (Ref. Nos. 6, pp. 57, 77, 79; 29, pp. 56, 64, 84)	11.3	3[3]	µg/l
	14MS101 (Ref. Nos. 6, pp. 50, 77, 97; 29, pp. 39, 64, 84)	7.2J[5]	0.78[3]	mg/kg

Background Hazardous Substances	Evidence	Concentration	DL	Units
Nickel	14MS101 (Ref. Nos. 6, pp. 50, 77, 97; 29, pp. 39, 64, 84)	Non-Detect	10.4[3]	mg/kg
Zinc	14MS101 (Ref. Nos. 6, pp. 50, 77, 97; 29, pp. 39, 64, 84)	4.3J[5]	5.2[3]	mg/kg

Notes:

1 - The Practical Quantitation Limits (PQLs) given in the Draft Final Remediation Investigation Report (Ref. No. 31, p. 99) and are equal or above the MDLs.

2 - µg/L - micrograms per liter

3 - These samples were analyzed using the CLP SOW (Ref. No. 30, p. 5). For aqueous samples, the Contract Required Detection Limit (CRDL) is the DL. For soil samples, in order to convert the CRDL to the DL, adjustments need to be made for percent solids, therefore, the following formula was used:

CRDL / (% solids/100)

4 - mg/kg - milligram per kilogram

5 - J - This indicates an estimated value (Ref. Nos. 29, p. 84; 30, p. 68; 31, p. 132), however, the substance was positively identified as being present..

6 - [] - This indicates that the reported value is less than the CRDL, but greater than or equal to the Instrument Detection Limit (IDL)

SOURCE NO. 1 - ZONE 1 LANDFILLS SAMPLE DESCRIPTIONS AND DEPTHS TABLE[1]							
SAMPLE	DESCRIPTION	DEPTH	REFERENCE	SAMPLE	DESCRIPTION	DEPTH	REFERENCE
Source Samples for Landfill No. 4				Background Samples for Landfill No. 4			
01LH01WL	Leachate	Surface	Nos. 16, pp. 53, 105-106	12MW01 RWG	Upgradient Groundwater Sample - Brown and Turbid	29.75 feet	Nos. 16, pp. 244, 267; 33, p. 214
SAMPLE	DESCRIPTION	DEPTH	REFERENCE	SAMPLE	DESCRIPTION	DEPTH	REFERENCE
Source Samples for Landfill No. 5				Background Samples for Landfill No. 5			
13-MS-101-006	Tan to Gray Fine Sand; orange and black laminae; mixed with Black Organic Silt	6-8 feet	No. 5, pp. 50, 63, 79	13-MS-102-005	Light gray Silty fine Sand; little Clay	5-7 feet	No. 5, pp. 50, 63, 83
SAMPLE	DESCRIPTION	DEPTH	REFERENCE	SAMPLE	DESCRIPTION	DEPTH	REFERENCE
Source Samples for Landfill No. 6				Background Samples for Landfill No. 6			
14LT-102	Orange Stained Leachate	Surface	No. 6, pp. 23-24, 29, 55	14MW101	Upgradient Groundwater Sample	7-17 feet	No. 6, pp. 77, 79, 99
14MS103	Tan to Brown Fine Sand; some organic material; mixed with Black organic Silt; some wood	5-7 feet	No. 6, pp. 50, 77, 105	14MS101	Light gray fine Sand mixed with dark brown to black Organic Silt with some fine sand	5-7 feet	No. 6, pp. 50, 77, 97
14MS104	Orange and Tan fine Sand mixed with Dark Brown Silty fine Sand	5-7 feet	No. 6, pp. 50, 77, 105				
14PS101	Fill mixed with Medium to Fine Sand	4-6 feet	Nos. 6, pp. 51, 77; 29, p. 22				

1 - Note: The leachate samples used for source characterization were compared to upgradient unfiltered groundwater samples; since leachate originates from groundwater to surface discharge these types of samples are comparable (Ref. Documentation Record, Source No. 1, Sample Descriptions and Depths Table). The soil types of the background samples are suitable for comparison to the source characterization samples as they consist of similar soils types (Ref. Documentation Record, Source No. 1, Sample Descriptions and Depths Table). The background samples presented in the table above were collected during a similar time frame and from locations suitable for comparison with the source samples based upon hydrogeology, topography and/or land use (Ref. Documentation Record, Source No. 1, Sample Descriptions and Depths Table).

2.4.2 Hazardous Waste Quantity

2.4.2.1.4. Area

Landfill No. 4 is 627,286 square feet in size (Ref. No. 16, p. 266). A scaled map was provided detailing the areal extent of the landfill (Ref. No. 16, p. 266). A digital planimeter was utilized in measuring the area of 627,286 square feet off of the scaled map (Ref. No. 16, p. 266). The boundaries of the landfill were established by a GPR survey (Ref. No. 16, p. 100). Landfill No. 5 is 202,973 square feet in size (Ref. No. 5, p. 63). A scaled map was provided detailing the areal extent of the landfill (Ref. No. 5, p. 63). A digital planimeter was utilized in measuring the area of 202,973 square feet off of the scaled map (Ref. No. 5, p. 63). The boundaries of the landfill were established by geophysical surveys (Ref. No. 5, pp. 63). Landfill No. 6 is 234,709 square feet in size (Ref. No. 6, p. 77). A scaled map was provided detailing the approximate areal extent of the landfill (Ref. No. 6, p. 77). A digital planimeter was utilized in measuring the area of 234,709 square feet off of the scaled map (Ref. No. 6, p. 77). The total area of the Zone 1 landfills equals: 627,286 + 202,973 + 234,709 = 1,064,968 square feet (Ref. Nos. 5, p. 63; 6, p. 77; 16, p. 266).

Dimension of source: 1,064,968 square feet

Reference(s): Nos. 5, p. 63; 6, p. 77; 16, p. 266

Area Assigned Value per the HRS Rule: 1,064,968 ÷ 3,400 = 313.23

(Ref. No. 1, Table 2-5)

2.4.2.1.5. Source Hazardous Waste Quantity Value

Source Hazardous Waste Quantity Value: 313.23

SOURCE DESCRIPTION

2.2 Source Characterization

Number of the source: 2

Name and description of the source: Landfill No. 2

Landfill No. 2 is located in the northwest portion of the MAFB adjacent to the North Run, which was used from 1950 to 1956 (Ref. Nos. 3, pp. 88-91; 16, p. 96; 21, p. 108). Wastes were deposited using the trench-and-fill method, and were burned to reduce volume (Ref. Nos. 3, pp. 89-90; 16, p. 96). The landfill was used for the disposal of general refuse, miscellaneous industrial chemicals, waste oil, coal ash, and scrap materials (Ref. No. 3, pp. 74, 80, 89-90). In November 1974, the EPA inspected the closed landfill (Ref. No. 3, p. 90). The northern portion of the landfill and the adjacent stream bed were found to contain miscellaneous debris, several deteriorated tanks, and 55-gallon drums containing unknown materials (Ref. No. 3, p. 90). A section of the landfill that was being used as an oil storage area by the Defense Property Disposal Office (DPDO) showed evidence of oil spillage (Ref. No. 3, pp. 84, 90-91). The EPA requested that the area be cleaned, and that all exposed wastes be removed or covered (Ref. No. 3, p. 91). The EPA reinspected the landfill in April 1975: the final inspection report indicated that the landfill surface and stream bed had been cleared and adequate final cover added to the landfill, such that there were no protruding waste materials (Ref. No. 3, pp. 91, 110). It was also reported that much of the scrap metal that had been present was sold to salvage dealers, and that other wastes were either buried within Landfill No. 2 or were relocated to other on-base landfills (Ref. No. 3, p. 91). The oil storage area was relocated inside a fenced area of the DPDO yard (Ref. No. 3, p. 91). As the removal actions conducted at this source were not complete (surficial/protruding materials only were addressed) and did not comply with disposal facility requirements (wastes were buried or moved to other locations on base), the removal actions are considered to be nonqualifying removals with respect to EPA policy on this issue (Ref. Nos. 3, pp. 90-91, 108, 110; 11). In 1982 it was reported that during a more recent inspection, the landfill was found to be covered with vegetation and that no surface refuse was observed (Ref. No. 3, pp. 5, 91). The fenced portion of the DPDO yard extends over a portion of the former landfill area (Ref. No. 3, pp. 84, 91). Surface drainage from Landfill No. 2 flows toward the North Run (Ref. No. 3, pp. 39, 84, 91). Landfill No. 2 was identified by the MAFB IRP and all IRP activities follow CERCLA procedures (Ref. No. 15, pp. 22, 52). Potential remedial options for Landfill No. 2 are being considered under a Focused Feasibility Study phase of the IRP (Ref. Nos. 15, pp. 52-53; 16, p. 140). It has been indicated that insufficient information is present available for evaluating the need for action for Landfill No. 2 (Ref. No. 15, p. 64). Chemical analysis of leachate samples detected inorganic hazardous substances at concentrations significantly greater than those detected in background groundwater samples (Ref. Nos. 16, pp. 197, 199-200, 264; 22, pp. 33-34; 31, pp. 114, 148, 169, 178). A data validation review was performed on the inorganic analytical results of the leachate samples collected in 1991 (Ref. No. 22, pp. 1, 6-9). The inorganic leachate sample collected during the 1996 field investigation was analyzed using SW-846 method 6010 and a validation was performed on the data results (Ref. No. 31, pp. 138, 144, 148).

Location of the source, with reference to a map of the site:

Landfill No. 2 is located near the northwest boundary of the MAFB property, between the North Run and Wrightstown-Cookstown Road (Ref. Nos. 3, p. 84; 21, p. 108).

Containment

Release to ground water - Not Evaluated

Release via overland migration and/or flood

There is no known liner or run-on control and runoff management system associated with this landfill (Ref. Nos. 3, pp. 84-85, 88-91; 16, p. 96). Landfill No. 2 was leveled with a sandy soil (Ref. No. 16, p. 96). A containment factor value of 10 is assigned since there is neither a maintained engineered cover or a functioning and maintained run-on control system and runoff management system is present (Ref. No. 1, Table 4-2).

2.4.1 Hazardous Substances

Source Hazardous Substances	Evidence	Concentration	DL	Units
Arsenic	02LH01WL[1] (Ref. Nos. 16, p. 264; 31, pp. 114, 178)	45.8	3	µg/l[2]
	10LT102XXX1XX (Ref. Nos. 16, p. 200; 22, pp. 1, 6-9, 33; 34, p. 2; 36, p. 4)	21.8	10	ug/l
Cadmium	01LH01WL (Ref. Nos. 16, p. 264; 31, pp. 114, 178)	31.8	1	µg/l
	10LT101XXX1XX (Ref. Nos. 16, p. 200; 22, pp. 1, 7, 33; 34, p. 2; 36, p. 4)	136 J[3]	5	ug/l
	10LT102XXX1XX (Ref. Nos. 16, p. 200; 22, pp. 1, 7, 33; 34, p. 2; 36, p. 4)	21 J[3]	5	ug/l
Copper	01LH01WL (Ref. Nos. 16, p. 264; 31, pp. 114, 148, 178)	127J[3]	1	µg/l
	10LT101XXX1XX (Ref. Nos. 16, p. 200; 22, pp. 1, 6-9, 33; 34, p. 2; 36, p. 4)	598	25	ug/l
	10LT102XXX1XX (Ref. Nos. 16, p. 200; 22, pp. 1, 6-9, 33; 34, p. 2; 36, p. 4)	42.5	25	ug/l
Lead	01LH01WL (Ref. Nos. 16, p. 264; 31, pp. 114, 148, 178)	242	2	µg/l
	10LT101XXX1XX (Ref. Nos. 16, p. 200; 22, pp. 1, 6-9, 33; 34, p. 2; 36, p. 4)	2970	3	ug/l
	10LT102XXX1XX (Ref. Nos. 16, p. 200; 22, pp. 1, 6-9, 33; 34, p. 2; 36, p. 4)	81.5	3	ug/l
Mercury	10LT101XXX1XX (Ref. Nos. 16, p. 200; 22, pp. 1, 6-9, 33; 34, p. 2; 36, p. 4)	0.51	0.2	ug/l
Nickel	10LT101XXX1XX (Ref. Nos. 16, p. 200; 22, pp. 1, 6-9, 33; 34, p. 2; 36, p. 4)	358[4]	40	ug/l
	10LT102XXX1XX (Ref. Nos. 16, p. 200; 22, pp. 1, 6, 33; 34, p. 2; 36, p. 4)	43 J[3]	40	ug/l
Zinc	01LH01WL (Ref. Nos. 16, p. 264; 31, pp. 114, 178)	1120	2	µg/l
	10LT101XXX1XX (Ref. Nos. 16, p. 200; 22, pp. 1, 6-9, 33; 34, p. 2; 36, p. 4)	4120	20	ug/l

Source Hazardous Substances	Evidence	Concentration	DL	Units
Zinc	10LT102XXX1XX (Ref. Nos. 16, p. 200; 22, pp. 1, 6-9, 33; 34, p. 2; 36, p. 4)	209	20	ug/l

Background Hazardous Substances	Evidence	Concentration	DL	Units
Arsenic	02WL01WG[1] (Total) (Ref. Nos. 16, pp. 199, 264; 31, pp. 114, 169)	72.7	3	µg/l
	10MWX26XXX01XX (Ref. Nos. 16, pp. 197, 263: 22, pp. 1, 6-9, 34; 34, p. 3; 35, p. 3)	Non-Detect	10	ug/l
	10MWX27XXX01XX (Ref. Nos. 16, pp. 197, 263: 22, pp. 1, 6-9, 34; 34, p. 3; 35, p. 4)	Non-Detect	10	ug/l
Cadmium	02WL01WG (Total) (Ref. Nos. 16, pp. 199, 264; 31, pp. 114, 169)	11.6	1	µg/l
	10MWX26XXX01XX (Ref. Nos. 16, pp. 197, 263: 22, pp. 1, 6-9, 34; 34, p. 3; 35, p. 3)	Non-Detect	5	ug/l
	10MWX27XXX01XX (Ref. Nos. 16, pp. 197, 263: 22, pp. 1, 6-9, 34; 34, p. 3; 35, p. 4)	Non-Detect	5	ug/l
Copper	02WL01WG (Total) (Ref. Nos. 16, pp. 199, 264; 31, pp. 114, 169)	1.3J[3]	1	µg/l
	10MWX26XXX01XX (Ref. Nos. 16, pp. 197, 263: 22, pp. 1, 6-9, 34; 34, p. 3; 35, p. 3)	Non-Detect	25	ug/l
	10MWX27XXX01XX (Ref. Nos. 16, pp. 197, 263: 22, pp. 1, 6-9, 34; 34, p. 3; 35, p. 4)	Non-Detect	25	ug/l
Lead	02WL01WG (Total) (Ref. Nos. 16, pp. 199, 264; 31, pp. 114, 169)	48.9	2	µg/l
	10MWX26XXX01XX (Ref. Nos. 16, pp. 197, 263: 22, pp. 1, 6-9, 34; 34, p. 3; 35, p. 3)	8.8[5]	3	ug/l
	10MWX27XXX01XX (Ref. Nos. 16, pp. 197, 263: 22, pp. 1, 6-9, 34; 34, p. 3; 35, p. 4)	Non-Detect	3	ug/l
Nickel	10MWX26XXX01XX (Ref. Nos. 16, pp. 197, 263: 22, pp. 1, 6-9, 34; 34, p. 3; 35, p. 3)	Non-Detect	40	ug/l
	10MWX27XXX01XX (Ref. Nos. 16, pp. 197, 263: 22, pp. 1, 6-9, 34; 34, p. 3; 35, p. 4)	Non-Detect	40	ug/l

Background Hazardous Substances	Evidence	Concentration	DL	Units
Mercury	10MWX26XXX01XX (Ref. Nos. 16, pp. 197, 263: 22, pp. 1, 6-9, 34; 34, p. 3; 35, p. 3)	Non-Detect	0.2	ug/l
	10MWX27XXX01XX (Ref. Nos. 16, pp. 197, 263: 22, pp. 1, 6-9, 34)	Non-Detect	0.2	ug/l
Zinc	02WL01WG (Total) (Ref. Nos. 16, pp. 199, 264; 31, pp. 114, 169; 34, p. 3; 35, p. 4)	73.9	2	µg/l
	10MWX26XXX01XX (Ref. Nos. 16, pp. 197, 263: 22, pp. 1, 6-9, 34; 34, p. 3; 35, p. 3)	29.7[5]	20	ug/l
	10MWX27XXX01XX (Ref. Nos. 16, pp. 197, 263: 22, pp. 1, 6-9, 34; 34, p. 3; 35, p. 4)	Non-Detect	20	ug/l

Notes:

1 - The DLs for these samples were taken from the PQLs given in the Draft Final Remediation Investigation Report (Ref. No. 31, p. 114).

2 - µg/L - microgram per liter

3 - J - This indicates an estimated value (Ref. No. 31, pp. 138, 148).

4 - The concentration value of Nickel (i.e., 358 ug/l) for sample 10LT101XX01XX was identified as estimated in Ref. No. 16, p. 200. However, a data validation review of the data point was conducted and it was determined that no qualification was needed for the data point (Ref. No. 22, pp. 1, 6-9, 33).

5 - Concentration values of Non-Detect in sample 10MWX26XXX01XX were identified in Ref. No. 16, p. 197. However, a data validation review of the data point revealed that concentrations of lead and zinc were detected by the chemical analysis (Ref. No. 22, pp. 1, 6-9, 34).

SOURCE NO. 2 - LANDFILL NUMBER 2 SAMPLE DESCRIPTIONS AND DEPTHS TABLE[1]							
SAMPLE	DESCRIPTION	DEPTH	REFERENCE	SAMPLE	DESCRIPTION	DEPTH	REFERENCE
Source Samples for Landfill No. 2				Background Samples for Landfill No. 2			
02LH01WL	Leachate	Surface	No. 16, pp. 50, 100	02WL01WG	Upgradient Groundwater Sample	13.29 Feet	Nos. 16, pp. 237, 264; 31, p. 211
10LT101 XXX01XX	Leachate	Surface	No. 16, pp. 99-100, 200	10MWX26 XXX01XX	Upgradient Groundwater Sample	Approx. 25 feet	No. 16, pp. 197, 237, 239
10LT102 XXX01XX	Leachate	Surface	No. 16, pp. 99-100, 200	10MWX27 XXX01XX	Upgradient Groundwater Sample	Unknown	No. 16, pp. 197, 237

1 - Note: The leachate samples used for source characterization were compared to upgradient unfiltered groundwater samples; since leachate originates from groundwater to surface discharge these types of samples are comparable (Ref. Documentation Record, Source No. 1, Sample Descriptions and Depths Table). The background samples presented in the table above were collected during a similar time frame and from locations suitable for comparison with the source samples based upon hydrogeology, topography and land use (Ref. Documentation Record, Source No. 1, Sample Descriptions and Depths Table).

2.4.2 Hazardous Waste Quantity

2.4.2.1.4. Area

Landfill No. 2 is 532,581 square feet in size (Ref. No. 16, p. 224). A scaled map was provided detailing the areal extent of the landfill (Ref. No. 16, p. 224). A digital planimeter was utilized in measuring the area of 532,581 square feet off of the scaled map (Ref. No. 16, p. 224). The boundaries of the landfill were established by a GPR survey (Ref. No. 16, pp. 96, 224).

Dimension of source: 532,581 square feet

Reference(s): No. 16, pp. 96, 224

Area Assigned Value per the HRS Rule: 532,581 ÷ 3,400 = 156.64

(Ref. No. 1, Table 2-5)

2.4.2.1.5. Source Hazardous Waste Quantity Value

Source Hazardous Waste Quantity Value: 156.64

SOURCE DESCRIPTION

2.2 Source Characterization

Number of the source: 3

Name and description of the source: Landfill No. 3

Landfill No. 3 is a rectangular-shaped landfill that operated from 1956 to 1957 (Ref. Nos. 3, pp. 88-89, 91; 20, p. 57). The Defense Access Highway passes over the center of the landfill (Ref. Nos. 3, p. 91). Wastes were buried in a large 18 to 20 foot deep pit that extended into the water table; no burning occurred at this landfill (Ref. No. 3, pp. 89, 91). Landfill No. 3 was used for the disposal of general refuse, miscellaneous industrial chemicals, coal ash, and scrap materials (Ref. Nos. 3, pp. 80, 89, 91; 20 p. 57). In 1982 it was reported that the areas adjacent to the landfill were covered with dense underbrush and small trees (Ref. No. 3, pp. 5, 93). Surface drainage from Landfill No. 3 flows south toward the North Run, which flows in an easterly direction from the landfill (Ref. No. 3, pp. 39, 89, 92). Landfill No. 3 was identified by the MAFB IRP and all IRP activities follow CERCLA procedures (Ref. No. 15, pp. 22, 52). Additional sampling investigations are proposed presently so that remedial options for Landfill No. 3 can be considered under a Focused Feasibility Study phase of the IRP (Ref. Nos. 15, pp. 52-53; 20, p. 76). Chemical analysis of a leachate sample collected from the landfill detected an organic hazardous substance at a concentration significantly above that detected in a background groundwater sample (Ref. No. 20, pp. 61, 83, 86, 96-97, 129, 131, 133). These samples were analyzed using SW-846 method 8240, and ten percent of the samples were validated according to USEPA Level IV data validation guidelines (Ref. No. 20, pp. 43-53).

Location of the source, with reference to a map of the site:

Landfill No. 3 is located adjacent to the northwestern boundary of the MAFB (Ref. No. 3, pp. 88, 92; 21, p. 108).

Containment

Release to ground water

Release via overland migration and/or flood

There is no known run-on control and runoff management system associated with Landfill No. 3. (Ref. No. 3, pp. 91, 93). The landfill surface is covered with vegetation and small trees (Ref. No. 3, p. 93; 20, p. 93). A containment factor value of 10 is assigned since there is neither a maintained engineered cover or a functioning and maintained run-on control system and runoff management system is present (Ref. No. 1, Table 4-2).

2.4.1 Hazardous Substances

Source Hazardous Substances	Evidence	Concentration	DL[1]	Units
Chloro- benzene	11-LT-001 (Ref. No. 20, pp. 44, 86, 131, 330)	4	2	µg/l[2]

Background Hazardous Substances	Evidence	Concentration	DL	Units
Chloro- benzene	11-MW-029 (Ref. No. 20, pp. 44, 86, 129, 330)	Non-Detect	2	µg/l

Notes:

1 - The DL is the NJDEP PQLs for Ground Water Quality Criteria (25 NJR 539) (Ref. No. 20, pp. 44, 330).

2 - µg/L - micrograms per liter

SOURCE NO. 3 - LANDFILL NUMBER 3 SAMPLE DESCRIPTIONS AND DEPTHS TABLE[1]							
SAMPLE	DESCRIPTION	DEPTH	REFERENCE	SAMPLE	DESCRIPTION	DEPTH	REFERENCE
Source Samples for Landfill No. 3				Background Samples for Landfill No. 3			
11-LT-001	Leachate	Surface	No. 20 pp. 61, 131	11-MW-029	Upgradient Groundwater Sample	Not Available	No. 20, pp. 83, 129, 131, 135

1 - Note: The leachate sample used for source characterization was compared to upgradient groundwater samples; since leachate originates from groundwater to surface discharge these types of samples are comparable (Ref. Documentation Record, Source No. 1, Sample Descriptions and Depths Table). The background samples presented in the table above were collected during a similar time frame and from locations suitable for comparison with the source samples based upon hydrogeology, topography and land use (Ref. Documentation Record, Source No. 1, Sample Descriptions and Depths Table).

2.4.2 Hazardous Waste Quantity

2.4.2.1.4. Area

Landfill No. 3 is 95,067 square feet in size (Ref. No. 20, p. 86). A scaled map was provided detailing the areal extent of the landfill (Ref. No. 20, p. 86). A digital planimeter was utilized in measuring the area of 95,067 square feet off of the scaled map (Ref. No. 20, p. 86). The boundaries of the landfill were established by a magnetometer survey (Ref. No. 20, pp. 58, 86).

Dimension of source: 95,067 square feet

Reference(s): No. 20, pp. 58, 86

Area Assigned Value per the HRS Rule: 95,067 ÷ 3,400 = 27.96

(Ref. No. 1, Table 2-5)

SD-Source Hazardous Waste Quantity Value
Source No.: 3

2.4.2.1.5. Source Hazardous Waste Quantity Value

Source Hazardous Waste Quantity Value: 27.96

SOURCE DESCRIPTION

2.2 Source Characterization

Number of the source: 4

Name and description of the source: Defense Reutilization and Marketing Office (DRMO) (aka Defense Property Disposal Office (DPDO)) - Contaminated Soil

The DPDO (Building 3609) provides control and warehousing of excess and surplus government property to prepare it for reuse, donation, sale, or other means of disposition (Ref. No. 3, pp. 83-84, 152). The DPDO has arranged for the disposal of used petroleum products, out-of-service transformers, and most hazardous wastes for both MAFB and Fort Dix (Ref. No. 3, p. 83). Materials that have been handled by the DPDO include, but are not limited to, used/waste oils, fuels, and hydraulic fluid, mercury, acids, spent solvents, and combined oils and solvents (Ref. No. 3, pp. 68-73, 83, 85). These materials were collected and held in either a 10,000-gallon underground tank located within the DPDO area and within the perimeter of former Landfill No. 2, or in barrels located in a separate storage area outside of what is now the fenced DPDO storage yard, and south of Landfill No. 2 (Ref. No. 3, pp. 83-84). The original barrel storage area was used from 1960 to 1975; in 1975, the barrel storage area was relocated inside the fenced DPDO storage yard (Ref. No. 3, pp. 83-84). The 10,000-gallon underground used oil tank was used from 1960 to 1979 (Ref. No. 3, pp. 83-84). Evidence of leakage in the original barrel storage area and of spillage around the underground tank inlet has been reported (Ref. No. 3, pp. 85-87). Out-of-service PCB transformers were temporarily held at the DPDO area prior to disposal from approximately 1955 to 1978 (Ref. No. 3, p. 83). Leakage reportedly occurred from these transformers (Ref. Nos. 3, p. 83; 16, p. 68). It has also been reported that PCBs were used at the DRMO as a dust suppressant (Ref. Nos. 16, p. 68; 32, p. 14). Chemical analyses of soil samples collected from the DRMO detected PCBs at concentrations significantly greater than background conditions (Ref. No. 32, pp. 89, 148-149, 152-155). The DRMO was identified by the MAFB IRP and all IRP activities follow CERCLA procedures (Ref. No. 15, pp. 22, 52). The U.S. Air Force has estimated that approximately 4,100 cubic yards of soil containing PCBs in concentrations exceeding 0.49 mg/kg need to be removed from the DRMO (Ref. No. 32, pp. 11, 20-21, 23-24, 25-28). The amount identified does not include soils that are contaminated with PCBs at concentrations ranging from those significantly above background (i.e., non-detect) to the 0.49 mg/kg cleanup level established by the U.S. Air Force (Ref. No. 32, pp. 38-57, 89-90).

Location of the source, with reference to a map of the site:

The DRMO (aka DPDO) area is located in the northwest portion of the MAFB, north of Wrightstown-Cookstown Road, and south of Landfill No. 2 (Source No. 2) (Ref. Nos. 3, p. 84; 16, p. 256; 21, p. 108).

Containment

Release to ground water

Not Evaulated

Release via overland migration and/or flood

There is no known cover or run-on control and runoff management system associated with contaminated soil (Ref. Nos. 3, pp. 83-84;16, pp. 90-93) A containment factor value of 10 is assigned since there is neither a maintained engineered cover or a functioning and maintained run-on control system and runoff management system is present (Ref. No. 1, Table 4-2).

2.4.1 Hazardous Substances

Source Hazardous Substances	Evidence	Concentration	DL[1]	Units
PCBs 06SL144 Aroclor-1260	(Ref. No. 32, pp. 89, 153)	690	198.66	ug/kg[2]
	06SL109 (Ref. No. 32, pp. 89, 148)	1600	805.20	ug/kg
	06SL119 (Ref. No. 32, pp. 89, 152)	230	38.28	ug/kg
	06SL146 (Ref. No. 32, pp. 89, 154)	480	187.44	ug/kg
	06SL143 (Ref. No. 32, pp. 89, 152)	2000	716.1	ug/kg
	06SL136 (Ref. No. 32, pp. 89, 149)	39000	7095.0	ug/kg

Background Hazardous Substances	Evidence	Concentration	DL	Units
PCBs 06SL108 Aroclor-1260	(Ref. No. 32, pp. 89, 148)	Non-Detect[26]J[3]	36.3	ug/kg

Notes:

1 - The DL is was determined by multiplying the Quantitation Factor by the Quantitation Limit (Ref. No. 32, pp. 148-149, 152-154).

2 - µg/kg - micrograms per kilograms

3 - Indicates that the compound was detected at an estimated value of 26, less than the specified minimum detection limit (Ref. No. 32, p. 155)

2.4.2. Hazardous Waste Quantity

2.4.2.1.3. Volume

Chemical analyses of surface soils samples collected from the DRMO detected PCBs at concentrations significantly greater than background conditions (Ref. No. 32, pp. 89, 148-149, 152-155). The soil samples selected for source characterization outline the area of observed soil contamination using samples analyzed at off-site laboratory (Ref. No. 32, pp. 89, 148-149, 152-155). The U.S. Air Force has estimated that approximately 4,100 cubic yards of soil containing PCBs in concentrations exceeding 0.49 mg/kg need to be removed from the DRMO (Ref. No. 32, pp. 11, 20-21, 23-24, 25-28). The amount identified does not include soils that are contaminated with PCBs at concentrations ranging from those significantly above background (i.e., non-detect) to the 0.49 mg/kg remediation level established by the U.S. Air Force (Ref. No. 32, pp. 38-57, 89-90). The actual quantity of the source would be equal the volume of all soils containing PCBs at concentrations significantly greater that background levels; however, the 4,100 cubic yards of soils containing PCBs in concentrations exceeding 0.49 mg/kg will be used as a conservative estimate of the source quantity (Ref. No. 32, pp. 11, 20-21, 23-24, 25-28, 38-57, 89-90)

Dimension of source: 4,100 yd^3

Reference Nos.: 32, pp. 11, 20-21, 23-24, 25-28

Volume Assigned Value = 4,100 ÷ 2,500 (Ref. No. 1, p. Table 2-5)

Volume Assigned Value: 1.64

2.4.2.1.5. Source Hazardous Waste Quantity Value

Source Hazardous Waste Quantity Value: 1.64

SITE SUMMARY OF SOURCE DESCRIPTIONS

Source No.	Source Hazardous Waste Quantity Value	Containment			
		Ground Water	Surface Water	Air Gas	Air Particulate
1	313.23	NS	10	NS	NS
2	156.64	NS	10	NS	NS
3	27.96	NS	10	NS	NS
4	1.64	NS	10	NS	NS
Total	499.47				

NS - Not Scored

4.1 OVERLAND/FLOOD MIGRATION COMPONENT

4.1.1.1 DEFINITION OF HAZARDOUS SUBSTANCE MIGRATION PATH FOR OVERLAND/FLOOD COMPONENT

The MAFB is located in two watersheds, one of which drains to Crosswicks Creek, located northeast of the site, and the other to North Branch Rancocas Creek, located south of the site (Ref. No. 3, pp. 37, 39). Crosswicks Creek and North Branch Rancocas Creek are tributaries of the Delaware River, located west of MAFB; however, the points of confluence of the creeks with the Delaware River do not occur within the 15-mile target distance limit (Ref. No. 3, pp. 37, 39). Of the four waste sources being scored for the HRS Documentation Record, none are located in the North Branch Rancocas Creek watershed (Ref. Nos. 3, pp. 37, 39; 7). Therefore, the Surface Water Migration Pathway for the MAFB has been evaluated for the Crosswicks Creek watershed (Ref. No. 7). Runoff from most of the area occupied by the Main Base is directed to either the North Run or the South Run of Crosswicks Creek (Ref. Nos. 3, pp. 37, 39; 7; 21, p. 108).

The furthest upstream probable point of entry of contaminants from Source No. 1 - Zone 1 Landfills to surface water would be at the northeast corner of Landfill No. 5 (Ref. Nos. 5, p. 63; 7; 21, p. 108). This landfill is situated between the South Run and the access road to the WWTP; runoff from all landfills in Source No. 1 is via overland into the South Run based upon topography (Ref. Nos. 5, p. 63; 6, p. 77; 7; 16, p. 265). Runoff from Source Nos. 2 and 3 (Landfill Nos. 2 and 3, respectively) is also overland, but will be to the North Run based upon topography, rather than to the South Run, of Crosswicks Creek (Ref. Nos. 7; 16, p. 260; 20, p. 86). The furthest upstream probable point of entry from Source No. 2 would be at the northwest corner of the landfill; the furthest upstream probable point of entry from Source No. 3 to the North Run would be approximately the point at which the stream emerges from under the Defense Access Highway (Ref. Nos. 7; 16, p. 260; 20, p. 86). Runoff from Source No. 4, the DRMO, is northward to the North Run based upon topography (Ref. Nos. 16, p. 223).

The North Run[1] flows at a rate ranging from 5.8 to 8.6 cubic feet per second (CFS) for a distance of 0.80 miles from the furthest upstream PPE at Landfill No. 2 to the furthest Downstream PPE at Landfill No. 3 (Ref. Nos. 7; 10, p. 2; 16, pp. 48, 50, 151, 214; 21, p. 108). The North Run continues to flow at a rate ranging from 5.8 to 8.6 CFS for a distance of 1.45 miles from the furthest downstream PPE at Landfill No. 3 to the Cookstown Pond (Ref. Nos. 7; 10, p. 2; 16, pp. 48, 50, 151, 214; 21, p. 108). The Cookstown Pond flows at a rate of 8.6 CFS for a distance of 0.35 miles until discharging back into the North Run (Ref. Nos. 7; 10, p. 2). The North Run continues to flow from Cookstown Pond, a fishery (Ref. 8), to its mouth at Oakford Lake for a distance of 1.05 miles at a rate of >10 CFS (Ref. Nos. 7; 10, p. 2). The North Run is lined with wetlands (Ref. 7).

The South Run[2] flows at a rate ranging from 5.7 to 8.6 CFS from the furthest upstream PPE at Landfill No. 5, just upstream of Landfill No. 4, 1.70 miles to its confluence with Crosswicks Creek (Ref. Nos. 7; 10, p. 2; 16, pp. 52-53, 151, 214; 21, p. 108). The Crosswicks Creek continues to flow at a rate of 31 CFS for 1.75 miles to the Oakford Lake (Ref. Nos. 7; 10, p. 2). The South Run is lined with wetlands (Ref. 7).

The Oakford Lake flows at a rate of 42 CFS for 1.35 miles back into the Crosswicks Creek at New Egypt (Ref. Nos. 7; 10, p. 2). The Crosswicks Creeks flows northward for 10.80 miles to the 15-mile Target Distance Limit at a rate of 135 CFS (Ref. Nos. 7; 10, p. 2). Crosswicks Creek is lined with wetlands for much of its length within the 15 mile TDL (Ref. 7).

Notes:

1 - The average flow rate of the North Run at the location of Landfill No. 2 was determined to be 500,250 cubic feet per day which is equal to 5.8 CFS (Ref. No. 16, p. 214). This flow rate was determined from volumetric flow rates measured in the field at sampling locations along the North Run (37-SW-02 and 37-SW03) (Ref. Nos. 16, pp. 48, 50, 151; 21, p. 108). The average flow rate of the North Run at Cookstown was identified by the USGS as 2.6 CFS (Ref. Nos. 7; 10, p. 2).

2 - The average flow rate of the South Run at the location of Landfill No. 4 was determined to be 490,000 cubic feet per day which is equal to 5.7 CFS (Ref. No. 16, p. 214). This flow rate was determined from volumetric flow rates measured in the field at sampling locations along the South Run (locations 15-SW-01 through 33-SW-01) (Ref. Nos. 16, pp. 52-53, 151; 21, p. 108).

4.1.2.1 LIKELIHOOD OF RELEASE

4.1.2.1.1 Observed Release

Direct Observation

Not Evaluated

Chemical Analysis

In 1996, three sediment samples were collected from the North Run in the vicinity of Landfill No. 2 and the DRMO (Ref. No. 16, pp. 94, 99, 190, 260). One sediment sample (00SD101XXX01XX) was collected from an upstream location (i.e., background) in the stream, while a second sample (00SD102XXX01XX) was collected immediately downstream of Landfill No. 2 (Ref. No. 16, p. 260). Analysis of the downstream sample detected inorganic hazardous substances at concentrations significantly greater than background level for those substances (Ref. No. 16, pp. 190, 260).

- Background Concentration

Sample ID	Sample Location	Date
00SD101XXX01XX	Sediment sample collected upstream of Landfill No. 2 in the North Run	4/17/91

(Ref. Nos. 16, p. 260; 21, pp. 109, 148)

Background Hazardous Substance	Sample ID	Concentration	Sample Quantitation Limit (DL)	Units	Reference(s)
Mercury	00SD101XXX01XX	Non-Detect	*	mg/kg	Nos. 16, pp. 190, 260; 21, pp. 109, 148
Nickel	00SD101XXX01XX	Non-Detect	*	mg/kg	Nos. 16, pp. 190, 260; 21, pp. 109, 148

* The DL was not specifically identified in the analytical results presented; however, descriptions for qualifications of the data results were identified (Ref. No. 16, p. 190). These qualifications indicate that concentrations of mercury and nickel were Non-Detect in Sample 00SD101XXX01XX (Ref. No. 16, p. 190).

- Contaminated Samples

Sample ID	Sample Location	Date
00SD102XXX01XX	Sediment sample collected downstream of Landfill No. 2 in wetlands hydraullically connected to the North Run.	4/17/91

(Ref. Nos. 7; 16, p. 260; 21, pp. 109, 148)

Release Hazardous Substance	Sample ID	Concentration	DL	Units	Reference(s)
Mercury	00SD102XXX01XX	0.26	*	mg/kg	Nos. 16, pp. 190, 260; 21, pp. 109, 148
Nickel	00SD102XXX01XX	24.1	*	mg/kg	Nos. 16, pp. 190, 260; 21, pp. 109, 148

* The DL was not specifically identified in the analytical results presented; however, descriptions for qualifications of the data results were identified (Ref. No. 16, p. 190). The lack of any qualifications indicate that concentrations of mercury and nickel were not estimated for any reason (Ref. No. 16, p. 190). Additionally, the lack of any qualification shows that the concentrations exceed the DL since the values would have been qualified had the DL not been exceeded (Ref. No. 16, p. 190).

Attribution: - The release sediment sample (i.e., 00SD102XXX01XX) was collected downstream of Landfill No. 2 on 4/17/91 (Ref. No. 16, p. 260). Wastes were deposited in the landfill using the trench-and-fill method, and were burned to reduce volume (Ref. No. 3, pp. 89-90; 16, p. 96). The landfill was used for the disposal of general refuse, miscellaneous industrial chemicals, waste oil, coal ash, and scrap materials (Ref. No. 3, pp. 74, 80, 89-90). In addition, waste mercury handled by the DPDO may have occured in barrells located within the perimeter of the Landfill No. 2 DPDO storage yard (Ref. No. 3, pp. 68, 83-84). Chemical analysis of leachate samples collected from Landfill No. 2 detected both mercury and nickel at concentrations significantly greater than those detected in background groundwater samples (Ref. Nos. 16, pp. 200, 263, 22, pp. 33-34). On 11/20/96, a single surface water sample (IU2A36SW01) was collected from the North Run downstream of Landfill No. 2 (Ref. Nos. 16, pp. 191, 261; 21, pp. 109, 149, 259). No other surface waters samples were collected from the North Run during a similar time frame for comparision purposes since the most recent round of surface water sampling prior occurred on 5/15/96 (Ref. Nos. 16, pp. 191, 261; 21, pp. 109, 149-150). However, the chemical analysis of the surface water sample (IU2A36SW01) detected mercury and nickel at concentrations of 0.6 and 172 ug/l, respectively (Ref. Nos. 16, p. 191; 21, p. 149). The metals concentrations in surface water sample IU2A36SW01 were considerably higher than background (i.e., regional), and may reflect leaching from Landfill No. 2 into the North Run (Ref. No. 21, pp. 88-89). It has been estimated that the rate of flow of a leachate seep from the landfill ranged from 1 to 2 gallons per minute (Ref. No. 16, p. 132). In addition, it was detemined that a dilution factor range of 3,000 to 6,000 exists for this seep upon discharge to the North Run (Ref. No. 16, pp. 132, 214).

Hazardous Substances Released: Mercury and Nickel

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Observed Release Factor Value: 550

4.1.2.1.2 POTENTIAL TO RELEASE

4.1.2.1.2.1 Potential to Release by Overland Flow

4.1.2.1.2.1.1 Containment

Source		Source Hazardous Waste Quantity Value > or = 0.5 (Enter Yes or No)	Containment Descriptor	Containment Factor Value
No. 1:	Zone 1 Landfills	Yes	No maintained engineered cover or functioning and maintained run-on control system and runoff management system	10
	(Ref. Nos. 3, pp. 93-95, 108, 112-113; 5, p. 14; 16, pp. 14, 37)			
No. 2:	Landfill No. 2	Yes	No maintained engineered cover or functioning and maintained run-on control system and runoff management system	10
	(Ref. Nos. 3, pp. 84-85, 88-91; 16, p. 96)			
No. 3:	Landfill No. 3	Yes	No maintained engineered cover or functioning and maintained run-on control system and runoff management system	10
	(Ref. Nos. 3, p. 91, 93; 20, p. 93)			
No. 4:	DRMO	Yes	No maintained engineered cover or functioning and maintained run-on control system and runoff management system	10
	(Ref. Nos. 3, pp. 83-84;16, pp. 90-93)			

==========

Containment Factor Value: 10

4.1.2.1.2.1.2 Runoff

Drainage Area

Because of the extensive storm drainage system at MAFB, the drainage area used to score this site is based strictly on the areas of the sources themselves for which an area could be readily and/or reasonably determined; the site drainage area cited herein therefore does not include any areas upgradient of the sources located in the Crosswicks Creek watershed (Ref. Nos. 5, p. 63; 6, p. 77; 7; 16, pp. 224, 266; 20, p. 86; 32, p. 89).

Source	Area	Reference
No. 1 - Zone 1, Landfill No. 4	14.4 acres	No. 16, p. 266
No. 1 - Zone 1, Landfill No. 5	4.66 acres	No. 5, p. 63
No. 1 - Zone 1, Landfill No. 6	5.39 acres	No. 6, p. 77
No. 2 - Landfill No. 2	12.23 acres	No. 16, p. 224
No. 3 - Landfill No. 3	2.18 acres	No. 20, p. 86
No. 4 - DRMO	1.85 acres	No. 32, pp. 89, 148-149, 152-155
	Sum: 40.71 acres	

Drainage area for the watershed: 40.71 acres
Drainage area value: 1
(Ref. No. 1, Table 4-3)

Rainfall

2-year, 24-hour Rainfall (inches): 3 to 3.5
Reference: No. 17

Soil Group

Soil Group	Reference	Soil Group Designation
Urban land, sandy	Nos. 3, pp. 40-41; 7; 9, pp. 6, 10-15	B
Made land, sanitary fill	Nos. 3, pp. 40-41; 9, pp. 4-5	Unknown
Westphalia fine, sandy loam	Nos. 3, pp. 40-41; 9, pp. 6-7, 10-15	B
Alluvial land, loamy	Nos. 3, pp. 40-41; 9, pp. 2-3, 8-15	B

==========

Drainage Area Value: 1 (Ref. No. 1, p. Table 4-3)
2-year, 24-hour Rainfall: 3.3 (Ref. No. 17)
Soil Group Designation: B (See Ref. Nos. cited above)
Rainfall/Runoff Value: 3 (Ref. No. 1, Table 4-5)

Runoff Factor Value: 1

(Ref. No. 1, Table 4-6)

4.1.2.1.2.1.3 Distance to Surface Water

Source	Distance to Surface Water	Reference
No. 1 - Zone 1 Landfills	25 feet	No. 5, p. 63
No. 2 - Landfill No. 2	15 feet	No. 16, p. 264
No. 3 - Landfill No. 3	200 feet	No. 20, p. 86
No. 4 - DRMO	160 feet	Nos. 16, p. 223; 32, p. 89

Shortest distance to surface water: 15 feet
Distance to Surface Water Factor Value: 25*

* Based on a shortest distance to surface water of 15 feet as cited above and the corresponding assigned value as per Table 4-7 of Ref. No. 1.

==========

Containment Value: 10
Runoff Factor Value: 1
Distance to Surface Water Factor Value = 25
Potential to Release by Overland Flow Value = (Containment Value) x (Runoff Factor Value) x (Distance to Surface Water Factor Value)
= 10 x 1 x 25
= 250 (Ref. No. 1, Section 4.1.2.1.2.1.4)

Potential to Release by Overland Flow Value: 250

4.1.2.1.2.2 Potential to Release by Flood

Source	Hazardous Waste Quantity Value 0.5 (yes/no)	Floodplain Category	Containment Factor Value	Flood Frequency Factor Value	Potential to Release by Flood Factor Value
No. 1	Yes	Not Applicable	10	0	0
No. 2	Yes	Source in 100-year floodplain	10	25	250
No. 3	Yes	Not applicable	10	0	0
No. 4	Yes	Not applicable	10	0	0

Ref. Nos. 1, Tables 4-8 & 4-9; 13, pp. 1-3

==========

Containment Value: 10
Flood Frequency Value: 25
Potential to Release by Flood Factor Value = (Containment Value) x (Flood Frequency Value)
= 10 x 25
= 250 (Ref. No. 1, Section 4.1.2.1.2.2.3)

Potential to Release by Flood Factor Value: 250

4.1.2.1.2.3 Potential to Release Factor Value

Potential to Release Factor Value = Potential to Release by Overland Flow Factor Value + Potential to Release by Flood Factor Value

Potential to Release Factor Value = 250 + 250 = 500

(Ref. No. 1, Section 4.1.2.1.2.3)

4.1.2.2 WASTE CHARACTERISTICS

4.1.2.2.1 Toxicity/Persistence

Hazardous Substance	Source No.	Toxicity Factor Value	Persistence Factor Value*	Toxicity/ Persistence Factor Value (Table 4-12)	Ref. No.
Arsenic	1, 2	10,000	1.0	10,000	2, p. 3
Barium	1	10,000	1.0	10,000	2, p. 3
Cadmium	1, 2	10,000	1.0	10,000	2, p. 4
Chloro-benzene	3	100	0.0007	0.07	2, p. 5
Copper	2	--	1.0	--	2, p. 6
Lead	1, 2	10,000	1.0	10,000	2, p. 7
Mercury	2	10,000	0.4	4,000	2, p. 7
Methyl Ethyl Ketone	1	10	0.4	4	2, p. 7
Nickel	1, 2	10,000	1.0	10,000	2, p. 8
PCBs	4	10,000	1.0	10,000	2, p. 9
Toluene	1	10	0.4	4	2, p. 10
Zinc	1, 2	10	1.0	10	2, p. 11

* - As the predominant type of surface water body between the probable point of entry of contaminants from the MAFB is that of a stream, persistence factor values for the water category of "river", rather than that of "lake", were used to calculate the waste characteristics values for each hazardous substance in subsections 4.1.2.2.1, 4.1.3.2.1, and 4.1.4.2.1 of the surface water migration pathway evaluation (Ref. No. 7).

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Toxicity/Persistence Factor Value: 10,000

4.1.2.2.2 Hazardous Waste Quantity

Source Number	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5.)	Is source hazardous constituent quantity data complete? (yes/no)
No. 1	313.23	No
No. 2	156.64	No
No. 3	27.96	No
No. 4	1.64	No

Sum of values: 499.47

A Hazardous Waste Quantity Factor Value of 100 is assigned since the summation of the quantity values for the sources is between 100 and 10,000 (Ref. No. 1, Table 2-6).

4.1.2.2.3 Waste Characteristics Factor Category Value

Toxicity/persistence factor value x hazardous waste quantity factor value = 10,000 x 100 = 1,000,000
(Ref. No. 1, Sections 2.4.2; 2.4.3; 4.1.2.2)

Toxicity/persistence factor value
x hazardous waste quantity factor value: $1x10^6$

==========

Hazardous Waste Quantity Factor Value: 100
Waste Characteristics Factor Category Value: 32

(Ref. No. 1, Sections 2.4.2; 2.4.3; 4.1.2.2)

4.1.2.3.1 Nearest Intake

Location of Nearest Drinking Water Intake: Not applicable; there are no known drinking water intakes in the Crosswicks Creek watershed within 15 miles downstream of MAFB.

Distance from the probable point of entry: Not applicable
Reference: Nos. 7; 14, pp. 1-6

Potential Contamination:

Type of surface water body: Not applicable (see above).

Dilution Weight: Not applicable

==========

Nearest Intake Factor Value: 0

4.1.2.3.2.4 Potential Contamination

Intake	Average Annual Flow (cfs)	Population Served	References

There are no known drinking water intakes in the Crosswicks Creek watershed within 15 miles downstream of MAFB (Ref. Nos. 7; 14, pp. 1-6).

Type of Surface Water Body	Total Population	Dilution-Weighted Population (Table 4-14)
Not applicable		

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Dilution-Weighted Population Served by Potentially Contaminated Intakes: Not applicable

Potential Contamination Factor Value: 0

4.1.2.3.3 Resources

The state water quality classification of the North Run and South Run, for it's in-stream segments on the MAFB and MAFB/Fort Dix properties, respectively, is PL (i.e., Pinelands); this classification indicates that one of its designated uses is for public potable water supply after such treatment as required by law or regulation (Ref. Nos. 1, Section 4.1.2.3.3; 7; 23, p. 15; 24, p. 13; 26, pp. 1, 3, 5-10).

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Resources Factor Value: 5

4.1.3.2 WASTE CHARACTERISTICS

4.1.3.2.1 Toxicity/Persistence/Bioaccumulation

Hazardous Substance	Source No.	Toxicity Factor Value	Persistence Factor Value	Food Chain Bioaccumulation Value	Toxicity/ Persistence/ Bioaccumulation Factor Value (Table 4-16)	Ref. No.
Arsenic	1, 2	10,000	1.0	5.0	$5x10^4$	2, p. 3
Barium	1	10,000	1.0	0.5	$5x10^3$	2, p. 3
Cadmium	1, 2	10,000	1.0	5000	$5x10^7$	2, p. 4
Chloro-benzene	3	100	0.0007	50.0	3.5	2, p. 5
Copper	2	---	1.0	50,000	---	2, p. 6
Lead	1, 2	10,000	1.0	50.0	$5x10^5$	2, p. 7
Mercury	2	10,000	0.4	50,000	$2x10^8$	2, p. 7
Methyl Ethyl Ketone	1	10	0.4	0.5	2	2, p. 7
Nickel	1, 2	10,000	1.0	0.5	5,000	2, p. 8
PCBs	4	10,000	1.0	50,000	$5x10^8$	2, p. 9
Toluene	1	10	0.4	50.0	200	2, p. 10
Zinc	1, 2	10	1.0	500	5000	2, p. 11

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Toxicity/Persistence/Bioaccumulation Factor Value: $5x10^8$

4.1.3.2.2 Hazardous Waste Quantity

Source Number	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5.)	Is source hazardous constituent quantity data complete? (yes/no)
No. 1	313.23	No
No. 2	156.64	No
No. 3	27.96	No
No. 4	1.64	No

Sum of values: 499.47

A Hazardous Waste Quantity Factor Value of 100 is assigned since the summation of the quantity values for the sources is between 100 and 10,000 (Ref. No. 1, Table 2-6).

4.1.3.2.3 Waste Characteristics Factor Category Value

Toxicity/persistence factor value x hazardous waste quantity factor value = 10,000 x 100 = 1,000,000

Toxicity/persistence factor value
X hazardous waste quantity factor value: $1x10^6$

(Toxicity/persistence x hazardous waste quantity) x bioaccumulation potential factor value = 1,000,000 x 50,000 = 5×10^{10}

(Toxicity/persistence x hazardous waste quantity)
X bioaccumulation potential factor value: $5x10^{10}$

(Ref. No. 1, Sections 2.4.2; 2.4.3; 4.1.3.2)

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Hazardous Waste Quantity Assigned Value: 100
Waste Characteristics Factor Category Value: 320

(Ref. No. 1, Sections 2.4.2; 2.4.3; 4.1.3.2)

4.1.3.3.1 Food Chain Individual

Sample ID: 00SD102XXX01XX
Hazardous Substance: Mercury
Bioaccumulation Potential: 50,000
(Ref. Nos. 2, p. 7; 16, pp. 190, 260; 21, pp. 109, 148; Documentation Record Section 4.1.2.1; Documentation Figure 1)

Identity of Fishery	Type of Surface Water Body	Dilution Weight	Reference(s)
Cookstown Pond	Minimal Pond (i.e., Minimal Stream	1.0	Nos. 1, Table 4-13, Section 4.1.3.3.1; 7; 8; 10, p. 2; 27

Since there is an observed release of a hazardous substance having a bioaccumulation factor value of 50,000 to a surface water in watershed where a fishery is present, a value of 20 is assigned for the Food Chain Individual Factor Value (Ref. Nos. 1, Section 4.1.3.3.1; 2, p. 7; 16, pp. 190, 260; 21, pp. 109, 148; Documentation Record Section 4.1.2.1).

Cookstown Pond is considered a fishery based on visual observation of people fishing in the pond (see Refs. 8;27) and statement of Frank Castro of "Franks Tackle Supply" that he, himself, has caught pickeral in the pond (Ref. 8).

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Food Chain Individual Factor Value: 20

4.1.3.3.2 Population

4.1.3.3.2.1 Potential Human Food Chain Contamination

Identity of Fishery	Annual Production (pounds)	Type of Surface Water Body	Average Annual Flow	Population Value (P_i)	Dilution Weight (D_i)	$P_i x D_i$
Cookstown Pond	>0	Minimal Pond (i.e., Minimal Pond)	7.9 cfs	0.03[(a)]	1	0.03

Nos. 1, Table 4-13, Section 4.1.3.3.1; 7; 8; 10, p. 2; 27

(A) A human food chain value of 0.03, as shown in Ref. No. 1, Table 4-18, has been assigned to obtain the most conservative nonzero production value from Table 4-18 for those fisheries for which no production data are available. In that fish are caught, it is known the catch is greater than zero lbs.

Cookstown Pond is considered a fishery based on visual observation of people fishing in the pond (see Refs. 8;27) and statement of Frank Castro of "Franks Tackle Supply" that he, himself, has caught pickeral in the pond (Ref. 8).

Sum of $P_i \times D_i$: 0.03
(Sum of $P_i \times D_i$)/10: 0.003
(Ref. No. 1, Section 4.1.3.3.2.3)

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Potential Human Food Chain Contamination Factor Value: 0.003

4.1.4.2 WASTE CHARACTERISTICS

4.1.4.2.1 Ecosystem Toxicity/Persistence/Bioaccumulation

Hazardous Substance	Source No.	Ecosystem Toxicity Factor Value	Persistence Factor Value	Ecosystem Toxicity/ Persistence Factor Value (Table 4-20)	Ref. No.
Arsenic	1, 2	10	1.0	10	2, p. 3
Barium	1	1	1.0	1	2, p. 3
Cadmium	1, 2	1,000	1.0	1,000	2, p. 4
Chlorobenzene	3	1,000	0.0007	0.7	2, p. 5
Copper	2	100	1.0	100	2, p. 6
Lead	1, 2	1,000	1.0	1,000	2, p. 7
Mercury	2	10,000	0.4	4,000	2, p. 7
Methyl Ethyl Ketone	1	1	0.4	0.4	2, p. 7
Nickel	1, 2	10	1.0	10	2, p. 8
PCBs	4	10,000	1.0	10,000	2, p. 9
Toluene	1	100	0.4	40	2, p. 10
Zinc	1, 2	10	1.0	10	2, p. 11

Hazardous Substance	Ecosystem Toxicity/ Persistence Factor Value	Bio-accumulation Factor Value (Section 4.1.3.2.1.2)	Ref. No.	Ecosystem Toxicity/ Persistence/ Bioaccumula-Factor Value (Table 4-21)
Arsenic	10	5.0	2, p. 3	50
Barium	1	0.5	2, p. 3	0.5
Cadmium	1,000	5,000	2, p. 4	$5x10^6$
Chlorobenzene	0.7	50.0	2, p. 5	35
Copper	100	50,000	2, p. 6	$5x10^6$
Lead	1,000	5,000	2, p. 7	$5x10^6$
Mercury	4,000	50,000	2, p. 7	$2x10^8$
Methyl Ethyl Ketone	0.4	0.5	2, p. 7	0.02
Nickel	10	0.5	2, p. 8	5
PCBs	10,000	50,000	2, p. 9	$5x10^8$
Toluene	40	0.5	2, p. 10	20
Zinc	10	500	2, p. 11	$5x10^3$

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Ecosystem Toxicity/Persistence/Bioaccumulation Factor Value: $5x10^8$

4.1.4.2.2. Hazardous Waste Quantity

Source Number	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5.)	Is source hazardous constituent quantity data complete? (yes/no)
No. 1	313.23	No
No. 2	156.64	No
No. 3	27.96	No
No. 4	1.64	No

Sum of values: 499.47

A Hazardous Waste Quantity Factor Value of 100 is assigned since the summation of the quantity values for the sources is between 100 and 10,000 (Ref. No. 1, Table 2-6).

4.1.4.2.3. Waste Characteristics Factor Category Value

Ecosystem toxicity/persistence factor value x hazardous waste quantity factor value = 10,000 x 100 = 1,000,000

Ecosystem toxicity/persistence factor value
X hazardous waste quantity factor value: $1x10^6$

(Ecosystem toxicity/persistence x hazardous waste quantity) x bioaccumulation potential factor value = (1×10^6) x 50,000 = 5×10^{10}

(Ecosystem toxicity/persistence X hazardous waste quantity)
X bioaccumulation potential factor value: $5x10^{10}$

(Ref. No. 1, Sections 2.4.2; 2.4.3; 4.1.4.2)

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Hazardous Waste Quantity Factor Value: 100
Waste Characteristics Factor Category Value: 320

(Ref. No. 1, Sections 2.4.2; 2.4.3; 4.1.4.2)

4.1.4.3.1.3 Potential Contamination

Sensitive Environments

Type of Surface Water Body	Sensitive Environment	Reference(s)	Sensitive Environment Value(s)
North Run/South Run (i.e., Minimal Streams)	Federal Land Designated for Protection of Natural Ecosystems	Nos. 1, Table 4-23; 3, p. 62; 7; 23, pp. 3-4, 15; 24, pp. 6-7, 11, 13-15; 25, pp. 1, 3-4; 26, pp. 1, 3, 5-10	75

Wetlands

Type of Surface Water Body	Wetlands Frontage[1]	Reference(s)	Wetlands Value for Type of Surface Water Body
Minimal stream[2]	6.37	No. 1, Table 4-24	150
Small to moderate[3] Stream	3.95	No. 1, Table 4-24	100
Moderate to large[4] Stream	14.71	No. 1, Table 4-24	350

1 - These wetlands, which are along the 15-mile surface water pathway, were measured from National Wetland Inventory Maps for New Jersey (Ref. No. 7). The following three wetland types were measured: PEM[(a)], PFO[(b)], and PSS[(c)] (Ref. Nos. 1, Table 4-24; 7; 28, pp. 4-5, 9). According to the National Wetland Inventory key, these three wetland types are Palustrine Emergent Wetland, Palustrine Forested Wetland, and Palustrine Scrub/Shrub Wetland, respectively (Ref. Nos. 7; 28, pp. 4-5, 9). These three wetland types are eligible to be used as HRS wetlands (Ref. No. 1, Table 4-24).

(a) - Where P = Palustrine, EM = Emergent Wetland (Ref. No. 28, pp. 4-5)
(b) - Where P = Palustrine, FO = Forested Wetland (Ref. No. 28, pp. 4-5)
(c) - Where P = Palustrine, SS = Scrub/Shrub Wetland (Ref. No. 28, pp. 4-5)

2 - Minimal streams are those water bodies which have flow rates less than 10 cfs (Ref. No. 1, Table 4-13). The North Run upsteam of Cookstown Pond, Cookstown Pond, and the South Run to its mouth are minimal streams as the flow rates for these surface waters are less than 10 cfs (Ref. Nos. 7; 10, p. 2; Documentation Record Section 4.1.1.1). The North Run upstream of Cookstown Pond contains 2.24 miles of wetland frontage, Cookstown Pond contains 0.74 miles of wetland frontage, and the South Run to its mouth contains 3.39 miles of wetland frontage (Ref. No. 7). Therefore, a total of (2.24 + 0.74 + 3.39=) 6.37 miles of wetland frontage occurs along minimal streams located within the 15-mile TDL (Ref. No. 7).

3 - Small to moderate streams are those water bodies which have flow rates between 10 to 100 cfs (Ref. No. 1, Table 4-13). The North Run downstream of Cookstown Pond, the Crosswicks Creek upstream of Oakford Lake, and Oakford Lake are all small to moderate streams as their flow rates fall between 10 and 42 cfs (Ref. Nos. 7; 10, p. 2). The North Run downstream of Cookstown Pond contains 0.85 miles of wetland frontage, Crosswicks Creek upstream of Oakford Lake contains 2.90 mile of wetland frontage, and Oakford Lake contains 0.2 miles of wetland frontage (Ref. No. 7). Therefore, a total of (0.85 + 2.90 + 0.2=) 3.95 miles of wetland frontage occurs along small to moderate streams located within the 15-mile TDL (Ref. No. 7).

3 - Moderate to large streams are those water bodies which have flow rates between 100 to 1,000 cfs (Ref. No. 1, Table 4-13). The Crosswicks Creek downstream of New Egypt is a moderate to large stream as the flow rate falls is less than 135 cfs (Ref. Nos. 7; 10, p. 2). A total of 14.71 miles of wetland frontage are located along this section of the Crosswicks Creek (Ref. No. 7).

Type of Surface Water Body	Sum of Sensitive Environment Values (S_j)	Wetland Frontage Value (W_j)	Dilution Weight (D_j)	$D_j(W_j + S_j)$
Minimal stream	75	150	1	225
Small to moderate stream	0	100	0.1	10.0
Moderate to large stream (Crosswicks Creek)	0	350	0.01	3.5

Sum of $D_j(W_j + S_j)$: 237.5
(Sum of $D_j(W_j + S_j)$)/10: 23.75

(Ref. No. 1, Table 4-24, Section 4.1.4.3.1.3)

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Potential Contamination Factor Value: 23.75